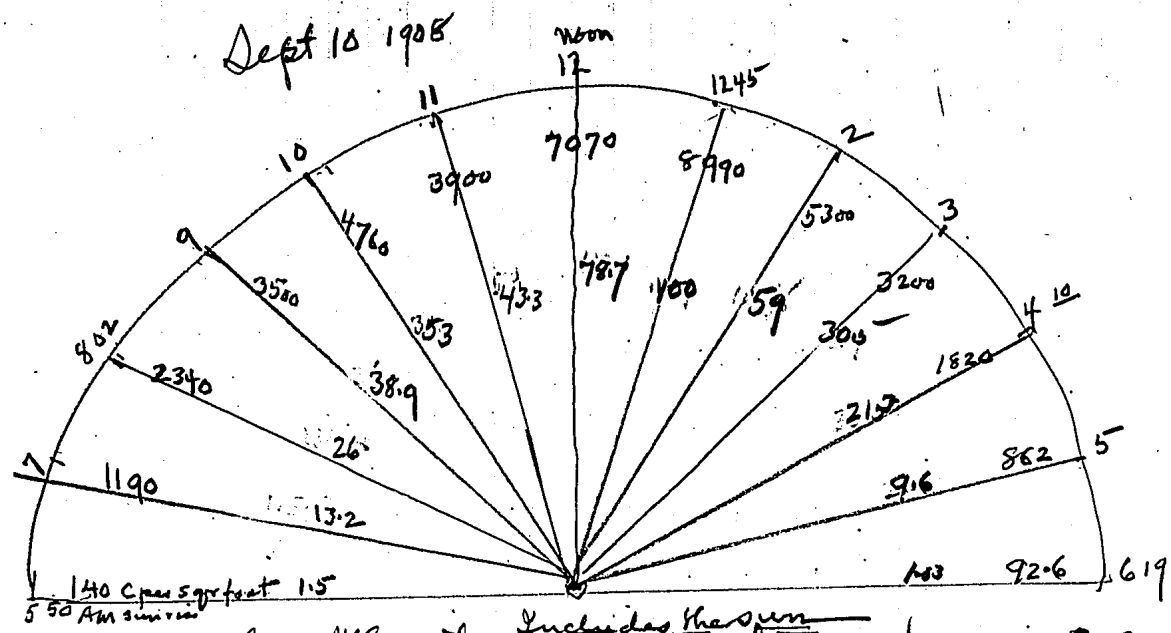
Notebook Series -- Notebooks by Edison
Notebook, N-08-09-10.2

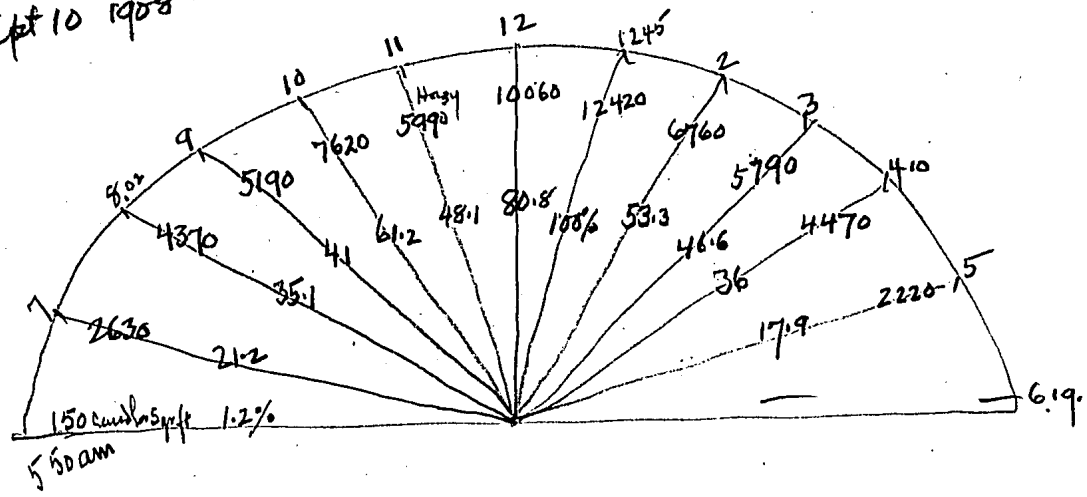
This notebook is a continuation of N-17-09-15. It was used by Edison aboard the USS *Sachem* in October 1917 in connection with his work for the U.S. Navy during World War I. The entries relate to visibility at sea and to camouflage experiments conducted under various light and weather conditions. These include experiments with ships camouflaged by different means, as well as experiments with painted boards of different shades erected on shore and viewed from Long Island Sound. There are also entries pertaining to a kite rudder and to smoke bombs. At the beginning of the book are two pages of data from September 1908 on daylight illumination, which were apparently copied from a published source. Edison's notes indicate that the *Sachem* cruised among Gardiners, Plum, and other islands, using Greenport, Long Island, as a base of operations. The front cover is marked "No 3." The pages are unnumbered. Approximately 30 pages have been used.



Daylight Illumination on a surface laying horizontal. Includes the sun

Maximum Illumination obtainable from the Sun — Illumination obtained on a surface directly facing the sun at all times.

Sept 10 1908.



A gun sighting telescope only lets 32.5 % of the light through.

In periscopes (modern) has so many optical elements that only 19 % of the light reaches the Eye of the observer

Periscopes have low magnification

The principle involved is like taking a telescope bring image to Eye piece the add another telescope with Eye piece to first Eye piece this Enlarges in other words you Condense & then enlarge

I looked thru the big End of Opera glass at boards which were fairly visible but at a considerable distance I could not see them therefore if the Eye piece was put to the Eye piece of a second Opera glass it would make it worse hence ~~Spec~~ periscopes are poor propositions for seeing objects at a distance,

There is another bad thing about a periscope
There is a loss of brilliancy a contrast in the image which is quite appreciable.
The Cause for this is light which has undergone 2 to 4 reflections from the glass surfaces
The light reflected from the second surface of the first lenses will return again from the surface which it comes but in doing so it will strike the first surface of the lenses & some of it will be again reflected toward the observer Similarly light reflected back from the first surface of prism Number 2 will hit the back of objective no 1 & part of it will be sent

to the observer while the remainder will impinge on the front surface of objective No 1 & part of that will be reflected to the observers Eyes & so on all thru the system.

Now all this reflected light dont contribute anything to the brightness of the picture for it dont come to focus at the proper point it has its own focal points & is out of focus at the place where the true image lies.
It therefore forms a Veil of stray light over the picture which detracts from its brilliancy

I think now I have the Explanation of the Camouflage it is This -

The sky line has a certain Luminosity, it dont appear to vary much during good light all day -

Now White boards & blackboards will look black & white EVEN if there was no sky line to Compare with,

Assuming the sky line Radiate a Constant quantity of light during the day all that is necessary is to regulate the shutter that the same shall radiate only the same amount of light as the Sky line, to do this it requires that the shutter must go from 100% white to 95% black to take care

of the Excess light reflected from the boards over & above the light due to the sky line

If the lumens per foot of sky line is only 400 then shutters must be kept out 400, nothwithstanding the Enormous amount of light impinging on the shutter.

Oct 1 1917

Rough Measurements made today by Photometer

Measuring the Lumens or Candle power per square foot of the Eastern sky line just above the water Angle 3 deg

gives following

	Candles per foot	
9 40 AM	381	12
10 05	405	13
11 00	342	11
11 30	365 373	12
12 noon	342	11
12 45 PM	284	9
1 20 "	277	9
2 20 "	277	9
3 15 "	317	10
3 45 "	295	9.7
4 05 "	243	8
4 45	169 all day average	5½
5 15	Excluded) 501.5 308	

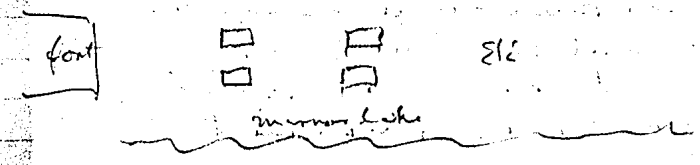
It looks from this that utilizing 1·7 % of the light of sun by the 12 mirrors at edge or on edge of top that with accumulation of clouds or even without clouds but moonlight that it will do the business in any event nearly do it Only about 175 to 200 Candles per sqr ft will be necessary as there is considerable reflection from sky Certainly 200 ards will do it of 30 lamps will do it.

Oct 2nd 1917

Dashan anchored in line with fort but off Orient point Plum Island Light house 4 hundred yards from fort

At 7.45 am Clear atmosphere in every part, scarcely a trace of haze even with very distinct land. Fort stands up in air + double by reflection. The 2 gulls stand part below horizon stands in air, All boards have disappeared. The above observations are from standing on deck

There must be some remarkable reason for disappearance of boards it may be a peculiar layer of air above the sea, refraction — On the pilot house boards are way up OK but double



But down on deck only now + then see the boards single not double, they will show up faintly then disappear very continuously showing

that the whole thing is due to a moving layer of air near the sea -

Sachem anchored at Island
Base of Little Gull Lighthouse invisible. shore line big gull at houses gone - no haze at all - Sea quiet. 2 or 3" waves very little wind -

I just tried a mirror on the white board on sachem & it certainly gives great promise. The yellow side exposed direct to sun showed very much higher illumination of a streak the width of the mirror + beam reaching up full height of board 6" ft - on white side got bright streak all way up -
There may be a trouble in using mirrors due to pitching & tumbling

Weather won't effect for if sky shows no sun boards are OK only needed in sunny days -

Oct 2 Sachem Exposing with Kite Ruddi - 1 mile from ~~[illegible]~~ all boards absolutely inky black Sky blue + clear all around no clouds hardly any haze -

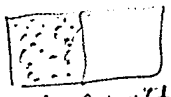
This is the Conditions ideal for very black shadows + we thus before them

Fishers Island clear but bottom imaged. Montauk Light House clear seen with naked Eye easy. Water nearly glassy + in places glassy

I tried the 6" string of 10c mirrors on the white board 6 X 12 on Sachem in shadow - It seem to do the big brighten up whole surface very much

It may be shutter blades could be made matte by burning on tacketed dia then matte buffed, try Expt

I lined a piece of fine matted tin foil + white glazed paper –



In shade

x matted foil – when close to glazed paper so very much whiter foil dark + lead color but 150 ft away both looked white Couldn't tell junction at several feet think foil would be whiter as it must reflect more light,

a Matte mirror also would spread light evenly + not

Concentrate, like seeg mirror

1050 AM all boards very black

Sachem 700 yrds away sea glassy no wind

See Monhanic Light house family with Eyes sharp and clear with glasses Extending way up like a steamers stack 3 miles away –

A Kite rudder is a case where ~~[illegible]~~ assembled, matter goes crazy,

1112 to 6 shows cohtenning test

Shot off Lgl 2 - Short hydraulics 400cc oleum - gun 45° day Exploded top breechlock

It was very white for 4 minutes then got thinner from moving away
Can see it much spread out 10 minutes afterwards
The strong Coulomm probably made it effaced
Notice it didnt settle down but keep up for whole 10 minutes

12 Noon No 6 white but Cant be squinted out
No 1 + 12 Dark brown

1 45 p No 9 squints out
No 3 against Gordon Island background

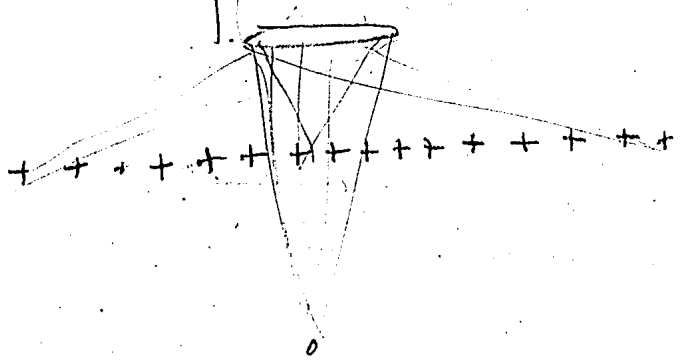
No clouds
Sachem at wrong angle to observe.
210 pm
Note Cupola on Lyle Island bottom: 9 + 10 boards –
Sun is so fine clouds
Even No 11 can almost be squinted out, Sachem two yds away 1 2 3 4 a
Same as against Gordon Island background 6 7 8 9 10 + 11 too white — this at 210 pm

Just fired another Lyle projectile – old thin tube, two Explosions gun just as left mouth. Cloud 50 @ 75 ft up. Evo cc drifted over towards Fisher Island apart

reach sea line covering
1/4 to 1/2 mile -
good for 8 minutes
Still in sight upon
sky line after 12 minutes
probably can be seen
for 20 minutes
gradually extended.
after 13 minutes quite
a section is on sea
line + fairly thick
+ actually obscures a little
land beyond Jordan Island
which I think is main
land -

~~gardiner island seen~~

3.15 PM 2 & 11 can segment
out 6 & 7 seem pure cirrite
Sky Clouds —
Gardiner Island almost
has sky line on sky line
Don't think seen from
viewing boat



+ sub that it could
make as much difference
as I changed a mile
should compensate

3 55 pm on way to Grampa's
No 10 disappeared with
eye probably 2 miles
probably 3 miles with
glass disappeared
absolutely – No 4
~~nearly gone~~ about same
but not so good 1 2 & 3
dark – This shows
5% is too great a
jump 1 to 2% is more
it is singular they
dont correspond
3 is quite dark when
10 absolutely disappeared

angle may have little to do
with it.

3 58 – 6 & 7 white &
Companion – 5 & 8 about
same tint.

4 = Now reflection towards
twice as high as wide
& more concave
10 & 4 sometimes flash
up very faintly –
past a little a beam of
Orient point.

4.04 – 4 & 10 not seen
other about same

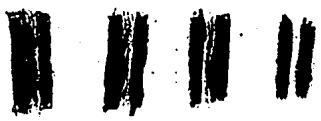
4.13 – all gone haunt but just look – foot stands out very bright & white –

we have been having & are still a little past account of Orient point

Board 6 X 12 white on scale – like lemon (Even when sun shining on board) is made brilliant for 1/4 of it & over whole is stronger than the sun direct at acute angle

Crayon Pencils (wax)

In very deep shade blue is next to black –
Next is Green
Next is Red
Next is Yellow but yellow is very near white,



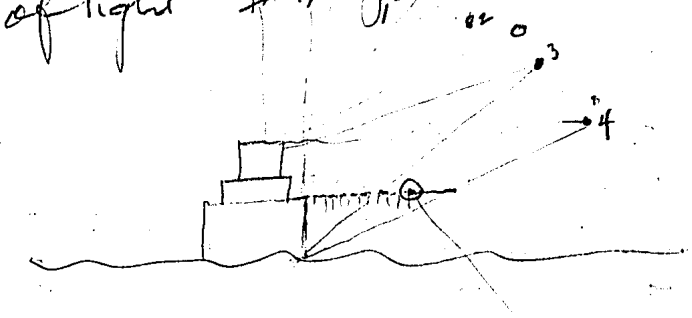
We tried arc light on board today Clear Western sky board on Dacham in shadow but rather light from white houses & board near dark – Spot with one lense 2 1/2 dia – not very bright would say double brightness arc strong looks hopeless

With Mirrors can get part of surface very bright

Arc + Incandescents probably hopeless + impracticable on a clear sky when ships is in shadow — possibly Incandescents might make bright spots all over screen by using headlight automobile for period before sun rises on power white boards but it would only be good for a little while,

The Mirror is very promising as for a light is concerned if it can be made practical + follow the sun when rolling + pitching it could be effectively + irregular which would blind at 4 miles I think -

For Camouflaging hull below on Summer idea think could paint hull white + then throw it in shadow by Canvas with holes in it to let them right amount of light



This could be done up to 3 pm then the light shines from absorption.

Work this up -

Tried painting thick on Tin -

Flake white from tube
Reg Carb Lead } Flag lead at sight best -
Zinc white from tube,
Ba Sulfate - Ng dirty yellow

I notice in very dark places
tin looked dark + white
looked white but if I
laid tin nearly horizontal
Tin looked bright + white
at that angle looked black
as compared to tin,
Why?

4 30 pm Viewing board
at angle looking towards
mirror but not at it
Board brilliantly

illuminated in the cheek
but looking broad side
very weak - guess particles
reflect out into space generally
but when looking at angle
the particles over whole
with board. Concentrate
their rays in a narrow
line & thus produce
brightness — This will
be BAD -

probably necessitate the mirror
being placed along top
of the shutters - if then
may not do it = Experiment.

Excluding Moon

Darkness —

	H	M
July	4.	19
Aug	5	40
Sept	7	29
Oct	9.	7
Nov	10.	29
Dec	11	20
Jany	11	29
Febr	10	45
March	9	50
April	8	
May	6.	19
June	4.	40

From Twilight am to Twilight PM — English Coast.

		Dark Night H	M		H	M
Jany	5.42 am	11	29	6 13 pm	12.	31
Feby	5 32 am	10	45	6 45	13	15
March	4 57	9	50	7. 17	14	10
April	4 am	8 —		8 pm	16	00
May	3 01 am	6.	19	8,42	17	41
June	2 12 am	4	40	9 32	19	20
July	2 07	4	19	9 48	19	41
Aug	2 50 am	5	40	9 10	18	20
Sept	3 38 am	7	29	8,09	16	31
Oct	4 17	9	7	7.10	14	53
Nov	4 52	10	29	6,23	13	31
Dec	5 23	11	20	6.3	12	40

Feby	24	21
March	3	22
"	10	17
	17	24
	24	25
	31	31
April	7	19
	14	28
	21	55
	28	48
May	5	46
"	12	23
	19	27
	26	19
June	3	18
"	10	32
	17	32
	24	28
July	1	20
	8	17
	15	18
	22	24
	29	21
Aug	5	23
	12	16
	19	18
	26	28
Sept	1	28
Sept	9	18
	16	28
	23	15
	30	13

Sept 19 Thursday nonwork

Boat trip ok benefit of
18½ hours of Camouflage
(Screen & darkness)
9½ screen - 9 Darkness
+ more later in season